Wind Harvest International

November 30, 2012

Attn: Nick Whitney:

Regarding the possible placement of wind turbines in the Coastal Zone; I should alert you to the bias our Company has about this potential. We have all been very personally involved over the years with the protection of the California Coastal Zone. Many of our key backers supported and were deeply involved with the state wide Proposition # 20 in the early 1970s. I served as full time co-chairman of the Costal Protection plan and have been committed to continued protection after the victory in that election.

We have strong opinions about the proper placement of wind turbines and would not recommend any such installation in the areas you are concerned about. I think it is important that there is an understanding of the key issues about any and all wind turbine installations. The most critical issue is the available 'resource' and the proper infrastructure that will allow wind turbines to function properly and to provide the most clean energy possible.

Wind energy is different in that the energy is a '**cubic function**' of the wind speed. That means simply; that every 3 ½ mile per hour increase of wind speed will **double** the output of electricity. An example- at a 15 mph site of proven annual average wind speed a turbine would produce $50,000 worth of electricity. But, at 18½ mph the turbine would produce $100,000 worth of electricity! It must be noted that the wind speed must be calculated on a proven **annual** average basis.

It should be noted that our CEO/inventor was the Mgr. of the Calif. Energy Commission and was responsible for initiating the wind farm concept. This approach has been copied world wide. In his experience the key to having a successful wind project is the proper resource plus the relevant infrastructure in place. This means having proven wind speeds of at least 15 mph [or more] annually; plus the electrical grid close nearby and easy access to roads; plus sites that are easy for installation. It is very apparent these key requirements are not in the coastal zone under consideration. We have observed too many wind turbine firms go bankrupt by not paying very close and serious attention to these requirements.

There are too many other areas in the U.S. where the conditions are appropriate for large scale wind turbine installations which ultimately will provide America with a major source of clean energy. That is why the area from Texas up to the Canadian border is termed the '*Saudi Arabia* ' of America for wind energy!

I hope this helps in your efforts to protect an area that should remain as pristine as possible.

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The forefathers of the various bodies of decision makers, that you are a part of today, were prophetic and sacrificed much in the way of nominal rewards to protect this county and the coast of this state from senseless exploitation in the vein of profiteering. We have a responsibility to echo their convictions and preserve this area, as they did for us, to fight for now. The Wind Industry has a commitment to their investors and their wallets and a total disregard for the value of this entire area. Embracing this industry and the failure it has been for almost 40 years is an unconscionable course to take without any real guarantee of benefit, on any scale remotely equivalent to what is in jeopardy. All anybody has to do is truly investigate this scam for what it really is … a S-WIND-le. Somehow it appears that this hasn't happened, and what will result is something you will not be proud of having supported. Mr. Kinsey said it well, please be advised.

Jan. 1, every family in America will see their taxes automatically go up."

He went on: "A typical middle-class family of four would see its income taxes go up by $2,200. That's $2,200 out of people's pockets. That means less money for buying groceries, less money for filling prescriptions, less money for buying diapers. It means a tougher choice between paying the rent and paying tuition. And middle-class families those Bush tax cuts are vital for America's middle class—and claims that the opposition to middle-class tax cuts proposed and put into law mainly by Republicans comes from . . . Republicans.

Perhaps the American people will accept this new Obama story line. If so, it will be because after years of assailing the GOP as the party of the plutocracy, this is the first time the American people have heard Mr. Obama or any

Sen. Harry Reid of Nevada, Ms. Pelosi's counterpart in the Senate leadership, voiced a similar complaint. Republicans, he said, "drew up their program to benefit the very, very, very few and eliminate the majority from any"—yes, *any*—"benefit of these tax cuts." In November 2008, he described the Bush economy as "built on a foundation for eight years that basically just value[s] tax cuts for the very wealthiest."

Don't expect the admission that the Bush cuts are vital to the middle class to provoke any challenges at the president's next press conference. Like the assertion that Republicans hate women, the GOP preference for tax cuts for the rich at the expense of the middle class has become accepted scientific fact. Even when President Obama himself shows just how wrong that is.

Write to MainStreet@wsj.com

Welcome to the Salazar Wilderness

By Michael Moritz

After a seaside area has been designated as wilderness, when is it considered pristine enough by Washington's standards? Is it after airplanes have been banned from flying over it? After electricity pylons and telephone cables have been removed, cars and bikers prohibited, the roads torn up? When hikers are forbidden access to trails, and kayakers, sailors and snorkelers banished from the water? When eucalyptus trees and other foreign species are eradicated? Or only after Miwok Indians' arrowheads have been excavated and placed in a museum?

Apparently it is none of the above, at least according to Secretary of the Interior Ken Salazar. Instead, he seems to think that turning a tiny portion of the lovely coastline of California's Marin County (part of the National Seashore) into the first marine wilderness in the continental United States also requires destroying a family-run oyster operation that has conducted business in the same spot for eight decades.

So Mr. Salazar recently ordered the business to close within 90 days—a decision that will spell ruin for the Lunny family, owners of Drake's Bay Oyster Farm, which supplies 40% of California's oysters.

The Lunny family, which has made major improvements to the farm operation it took over in 2004, has been hounded for

> Shame on the Interior Department for trying to drum a family-owned enterprise out of business.

years by a National Park Service with a vendetta so chilling that any rancher on federal lands should be alarmed. Goaded by a clutch of environmental groups, the Park Service has resorted to tactics that might have come straight from Nixon's dirty-tricks department. For instance, the Park Service alleged that the farm's oyster boats disturbed the quiet of the area, but the measurements used were revealed to have been taken in New Jersey—and involved jet skis.

For years, Park Service officials have colluded with the California Coastal Commission to hammer the small oyster company with allegations about purported abuses and violations of some of the many overlapping, confusing and contradictory permits with which it is supposed to comply.

California Sen. Dianne Feinstein has for years been sounding the alarm about the behavior of the Park Service. In a May letter to the California Fish and Game Commission, she outlined her worries—including a mention of the jet-ski episode—and said: "I became concerned about this issue when I found that the science regarding the impacts of the oyster farm had been manipulated, and that the oyster farm operator had been treated in a biased and unfair manner. The Park Service has repeatedly misrepresented the scientific record since 2006 to portray the farm as environmentally harmful, and it is my belief that the Park Service is doing everything it can to justify ending the oyster farm's operations."

Unable to use its doctored studies to close the farm, the Park Service changed tack and resorted to even more dubious arguments. It claimed that a lease signed 40 years ago wasn't renewable. There are only two snags with this argument.

First, the lease doesn't say that it isn't renewable. Second, the congressmen who helped form the Point Reyes National Seashore have firmly stated that their intention was to ensure the continued operation of the small farms that were occupying the land. Yet the Interior Department has ignored the statements of former California Reps. Pete McCloskey (no staunch right-winger, by the way, but a pro-choice advocate and backer of stem-cell research and assisted suicide) and John Burton (a former California Democratic Party chairman).

The Park Service ignored another inconvenient fact: It doesn't control fishing rights in the disputed area. Those are controlled by the State of California. So last week the Lunnys sued Mr. Salazar, the Department of the Interior, the National Park Service and its director. Now a U.S. judge gets to decide whether the federal government can bully this small business out of existence.

Mr. Moritz is chairman of Sequoia Capital.

based on maximizing the resources that the state could extract from the peasant population.

Here Gaidar is echoing a point that has been ably made at greater length by the historian Alexander Etkind of Cambridge University. The natural abundance of Russia—furs and forests in the past, mineral resources later—encourages rulers to loot their country by "internal colonization" rather than to develop it.

In the years before the Russian Revolution, Gaidar argues, the country was beginning to shed the burden of its past, with urbanization and fast economic growth narrowing the gap with Europe. But communist economics brought a sharply different course, marked by the state ownership of property, the bureaucratic allocation of resources, forced industrialization, militarism and ruthless political repression.

The economic growth that followed the revolution was fitful and unsustainable, Gaidar notes, recapitulating a theme of his earlier book, "Collapse of an Empire" (published in English in 2007). In "Russia: A Long View" he turns quickly to the months after the Soviet collapse, citing the graphic memorandums about impending famine and social breakdown that piled up on his desk in November 1991. He rebuts several ideas about what happened at that time, including the bogus claim that economic reform caused the crisis—i.e., that price liberalization, monetary stabilization and privatization resulted in a catastrophic fall in output.

Such a claim, Gaidar says, comes from viewing the problem the wrong way round. Soviet money wasn't real money, just as Soviet output wasn't real production. The economy created goods and services that nobody wanted via processes that destroyed value rather than creating it. Ending phony incentives to produce was bound to send recorded output crashing down. Reform was necessary because the Soviet leadership had bequeathed a crisis that threatened the country's very existence.

Gaidar concludes by assessing Russia's current leadership. "It is not hard to be popular and have political support," he writes, "when you have ten years of growth of real income at 10 percent a year." But that era is over. The regime must now choose between repression ("tempting but suicidal") and what he calls "regulated liberalization." In particular, he argues that Russia needs to restore freedom of speech, open up its process of decision-making, institute an independent judiciary and wage a "war on corruption." Taiwan, Spain and Chile, he says, offer examples of how to do it. It would be a task worthy of Gaidar's own talents, if only he were around to offer them.

Mr. Lucas is the author of "Deception," a new book on Russian espionage, and "The New Cold War: Putin's Russia and the Threat to the West."

Green Illusions

The Dirty Secrets of Clean Energy and the Future of Environmentalism | Ozzie Zehner

Japan, and Europe, we now have solid field data indicating that (1) the benefits of solar cells are insignificant compared to the expense of realizing them, (2) the risks and limitations are substantial, and (3) the solar forecast isn't as sunny as we've been led to believe.

Considering the extreme risks and limitations of today's solar technologies, the notion that they could create any sort of challenge to the fossil-fuel establishment starts to appear not merely optimistic, but delusional. It's like believing that new parasail designs could form a challenge to the commercial airline industry. Perhaps the only way we could believe such an outlandish thought is if we are told it over, and over, and over again. In part, this is what has happened. Since we were children, we've been promised by educators, parents, environmental groups, journalists, and television reporters that solar photovoltaics will have a meaningful impact on our energy system. The only difference today is that these fairy tales come funded through high-priced political campaigns and the advertising budgets of BP, Shell, Walmart, Whole Foods, and numerous other corporations.

Solar cells shine brightly within the idealism of textbooks and the glossy pages of environmental magazines, but real-world experiences reveal a scattered collection of side effects and limitations that rarely mature into attractive realities. There are many routes to a more durable, just, and prosperous energy system, but the glitzy path carved out by today's archaic solar cells doesn't appear to be one of them.

2. Wind Power's Flurry of Limitations

Evidence conforms to conceptions just as often as conceptions conform to evidence. –Ludwik Fleck, *Genesis and Development of a Scientific Fact*

By the end of grade school, my mother maintains, I had attempted to deconstruct everything in the house at least once (including a squirrel that fell to its death on the front walk). Somewhere in the fog of my childhood, I shifted from deconstruction to construction, and one of my earliest machinations was a windmill, inspired by a dusty three-foot-diameter turbine blade laying idle in the garage thanks to my father's job at a fan-and-turbine manufacturer. Fortunately, the turbine's hub screws fit snugly around a found steel pipe, which formed a relatively solid, if rusty, axle for the contraption. I mounted the axle in wood rather than steel, since my parents had neglected to teach me to weld. There were no bearings, but I dusted the naked holes with powdered graphite for lubrication; I was serious. Lacking the resources to design a tower, a wood picnic table in the backyard proved sufficient.

Some subsequent day, as cool winds ripped leaves from surrounding oak trees and threw them

at passersby, I hauled the rickety contraption from the garage to the picnic table, exposed nails and all. I first pulled the wooden mount up onto the table, weighing it down with bricks and other heavy objects. I then inserted the axle-and-turbine assembly. The already rotating blades hovered out over the table's edge, but there was little time to appreciate my work. Before the lock pin was properly secured, the heavy blade had already begun to spin uncomfortably fast. Only at that moment did it become apparent that I had neglected to install a braking mechanism, but it was too late.

I removed a brick from the base and pressed it against the rotating axle to slow it down, pushing with all my might. The axle hissed as the blades effortlessly accumulated greater speed. I jumped back when the axle's partially engaged lockpin flew out. The picnic table vibrated as the dull black blades melted into a grayish blur. The steel sails thumped through the air with a quickening rhythm of what in essence had become an upended lawnmower shrieking the song of a helicopter carrying a hundred cats in heat. What happened thereafter can only be deduced, because by the time the howling and clamor came to an abrupt end, my adrenaline-filled legs had already carried me well beyond the far side of the house.

I returned to find an empty picnic table in flames.

Now, if you can imagine a force ten thousand times as strong, you'll begin to appreciate the power of modern wind turbines, weighing in at 750 tons and with blade sweeps wider than eleven full-size school buses parked end-to-end.[1]

Like solar cells, wind turbines run on a freely available resource that is exhibiting no signs of depletion. Unlike solar cells, though, wind turbines are economical—just a sixth the cost of photovoltaics, according to an HSBC bank study. Proponents insist that wind power's costs have reached parity with natural-gas electrical generation. Coal-fired electricity is still less expensive, but if a carbon tax of about thirty dollars per ton is figured into

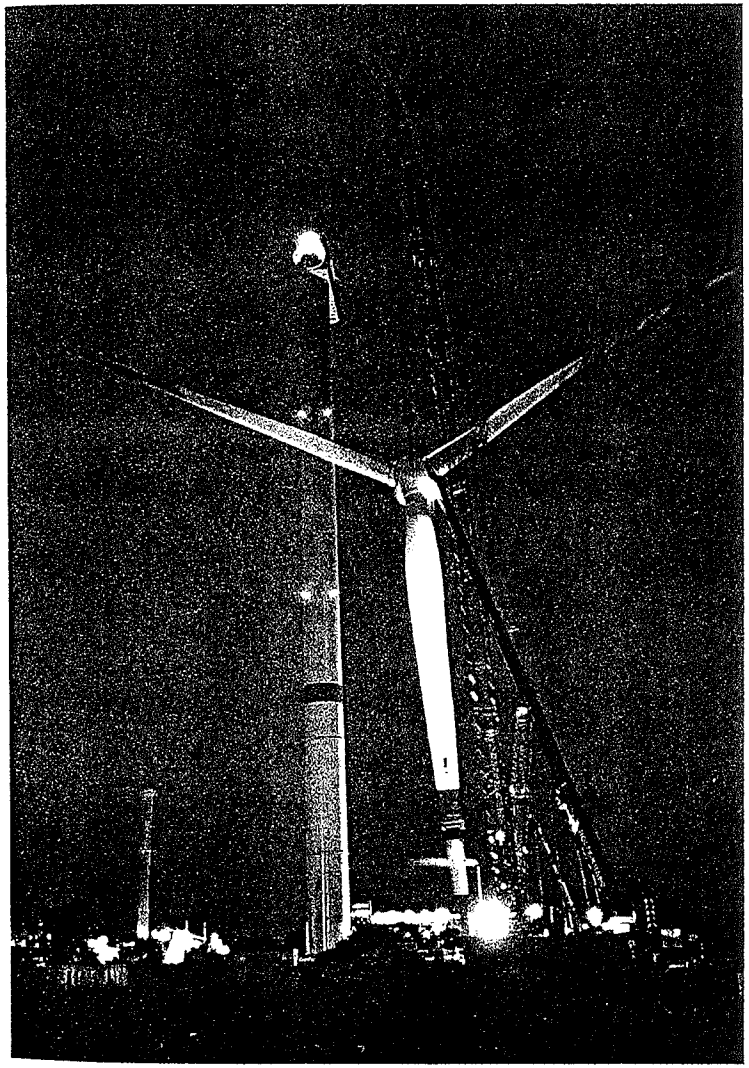

Illustration 2: An imposing scale Raising a blade assembly at night outside Brunsbüttel, Germany, with a second tower in the background. The turbine sits on 1,700 cubic yards of concrete with forty anchors each driven eighty feet into the earth. (Photo by Jan Oelker, courtesy of Repower Systems AG)

the equation, proponents insist that wind achieves parity with coal as well.[2] Either way, wind turbines seem far more pleasant as they sit in fields and simply whirl away.

Today's wind turbines are specially designed for their task and as a result are far more technologically advanced than even those built a decade ago. New composites enable the spinning arms to reach farther and grab more wind while remaining flexible enough to survive forceful gusts. New turbines are also more reliable. In 2002, about 15 percent of turbines were out of commission at any given time for maintenance or repair; now downtime has dropped below 3 percent. Whereas a coal or nuclear plant mishap could slash output dramatically or even completely, wind farms can still pump out electricity even as individual turbines cycle through maintenance. Similarly, new wind farms start to produce power long before they are complete. A half-finished nuclear plant might be an economic boondoggle, but a half-finished wind farm is merely one that produces half the power. Adding capacity later is as simple as adding more turbines. Farmers who are willing to give up a quarter of an acre to mount a large turbine in their fields can expect to make about ten thousand dollars per year in profit without interrupting cultivation of the surrounding land. That's not bad considering the same plot seeded with corn would net just three hundred dollars' worth of bioethanol.[3]

At first glance, deploying wind turbines on a global scale does not apparently pose much of a challenge, at least not an insurmountable one. It seems that no matter what yardstick we use, wind power is simply the perfect solution.

If only it were that simple.

Wind Power in Sixty Seconds or Less

As our sun heats the earth's lower atmosphere, pockets of hot air rise and cooler air rushes in to fill the void. This creates wind. For over two thousand years humans harnessed wind for pumping water, grinding grain, and even transatlantic travel. In fact, wind power was once a primary component of the global energy supply. No more. The Industrial Revolution (which could just as easily have been dubbed the Coal Revolution) toppled wind power's reign. Shipbuilders replaced masts with coal-fired steam engines. Farmers abandoned windmills for pumps that ran on convenient fossil fuels. Eventually, industrialists led the frail wind-power movement to its grave, and gave it a shove. There it would lie, dead and forgotten, for well over a hundred years, until one crisp fall day when something most unexpected occurred.

A hundred years is a short beat in the history of humans but a rather lengthy period in their history of industrialization. And when wind power was eventually exhumed, it found itself in a much-altered world, one that was almost entirely powered by fossil fuels. There were many more humans living at much higher standards of living. A group of them was rather panicked over the actions of an association called the Organization of Arab Petroleum Exporting Countries (OPEC). The scoundrels had decided to turn off their fossil-fuel spigot.

The oil embargo of 1973 marked the resurrection of wind power. Politicians dusted off wind power, dressed it in a green-collared shirt, and shoved it into the limelight as the propitious savior of energy independence. Wind power was worshiped everywhere, but nowhere more than in California. During the great wind rush of the early 1980s, California housed nearly 90 percent of global wind-generation capacity, fueled by tax subsidies and a wealthy dose of sunny optimism.[4] And since the windmill industry had vanished long ago, fabricators cobbled together the new turbines much like the one of my youth, with an existing hodgepodge of parts already available from shipbuilders and other industries. Perhaps predictably, when the oil started to flow again, political support for wind energy subsidies waned. Eventually they vanished altogether. But now, with so many

humans using so much energy, it wouldn't be another hundred years before they would call on wind power again.

During the first decade of the twenty-first century, oil prices skyrocketed. But another phenomenon shot up faster: media and political reporting on wind energy.[5] For every doubling of oil prices, media coverage of wind power *tripled*. Capacity grew too—as much as 30 percent annually. But at the end of the decade, an economic crisis smacked wind down again. Wind projects across the planet were cancelled, signaled most prominently by the flapping coat tails of energy tycoon T. Boone Pickens, as he fled from his promise to build massive wind farms in Texas. Financial turmoil further embrittled the fragile balance sheets of turbine manufacturers until orders began to stabilize again around 2011.

By 2012, worldwide wind-power generation capacity had surpassed two hundred gigawatts—many times the capacity of solar photovoltaics but not enough to fulfill even a single percent of global energy demand. We have thrice witnessed the fortunes of wind shifting in the industry's sail and we may find the future of wind power to be similarly constrained, as its detractors are raring to point out.

The Detractors

A boot tumbling around in a clothes dryer—that's how residents of Cape Cod describe the wind turbine whining and thumping that keeps them awake at night and gives them headaches during the day. One wind turbine engineering manual confirms that this noise, produced when blades swoop by the tower, can reach one hundred decibels, or about as loud as a car alarm. Multiple turbines can orchestrate an additive effect that is especially maddening to nearby residents. The fact that there is already a condition recognized as "wind turbine syndrome" testifies to the seriousness of their protest. In addition to noise, detractors point to various other grievances. For instance, turbine blades occasionally ice up, dropping or throwing ice at up to two hundred miles per hour. They may also toss a blade or two, creating a danger zone within a radius of half a mile.[6] Beyond this zone, residents are relatively safe from harm, and outside a one-mile radius the racket of wind turbines diminishes to the level of a quiet conversation. Ideally energy firms would not build wind turbines near homes and businesses but many of the other prime windy locations are already taken, geologically unstable, inaccessible, or lie within protected lands such as national parks. As a result, desperate wind power developers are already pushing their turbines both closer to communities and out into the sea, a hint as to limitations ahead.

Wind farm opponents tend to arise from one of two groupings, which are not always so easily distinguished from one another. The first are the hundreds of NIMBY (Not in My Backyard) organizations. NIMBY activists live near beautiful pastures, mountain ridges, and other sights they'd prefer to pass on to their children untarnished. They rarely have an economic interest (or anything else to gain) by erecting lines of wind turbines across their landscapes, each taller than the statue of liberty. Can we really blame them for being upset? Generating the power of a single coal plant would require a line of turbines over one hundred miles long. In a *New York Times* editorial, Robert F. Kennedy Jr. declared,

> I wouldn't build a wind farm in Yosemite Park. Nor would I build one on Nantucket Sound. . . . Hundreds of flashing lights to warn airplanes away from the turbines will steal the stars and nighttime views. The noise of the turbines will be audible onshore. A transformer substation rising 100 feet above the sound would house giant helicopter pads and 40,000 gallons of potentially hazardous oil.[7]

Kennedy and other politically well-connected residents of the Sound echo concerns voiced around the world. Even in Europe, where residents generally support wind power, locals often squash plans to build the rotating giants. In the Netherlands,

local planning departments have denied up to 75 percent of wind project proposals.[8]

The second group of wind detractors is an unofficial assemblage of coal, nuclear power, and utility companies happy to keep things just as they are. Contrary to public opinion, they aren't too concerned about wind turbines eroding their market share. They're far more concerned that legislators will hand over their subsidies to wind-farm developers or institute associated regulations. These mainstay interests occasionally speak through their CEOs or public relations departments but their views more frequently flow to the media via a less transparent route interceded by think tanks and interest groups. The Cato Institute has taken aim at wind power for over a decade, and their criticisms have been published in *The National Review*, *Marketplace*, the *Washington Times*, and *USA Today*. The Centre for Policy Studies, founded in part by Margaret Thatcher, has done the same. A keen eye can identify these corporate perspectives, which emanate in the form of white papers, newspaper articles, research reports, letters to the editor, and op-eds because they all have one distinct marking in common. They invariably conclude with policy recommendations calling on public and legislative support for our friends in the fossil-fuel and nuclear industries.

NIMBY groups have found a strange bedfellow in these corporate energy giants. Each faction is more than willing to evoke wind power drawbacks that the other develops. Environmentalists sometimes find themselves caught in the mix. For instance, during the 1980s, the Sierra Club rose in opposition to a wind farm proposed for California's Tejon Pass, citing risks to the California condor, an extinct bird in the wild that biologists were planning to reestablish from a small captive population. A Sierra Club representative quipped that the turbines were "Cuisinarts of the sky," and the label stuck. Our detractors passionately cite the dangers to birds and bats as giant blades weighing several tons, their tips moving at two hundred miles per hour,

spin within flight paths. However, newer turbine models spin more slowly, making them less a threat. Their smooth towers are less appealing for nesting than the latticed towers of earlier designs. According to one study, each turbine kills about 2.3 birds per year, which, even when multiplied by ten thousand turbines, is a relatively small number compared to the four million birds that crash into communication towers annually, or the hundreds of millions killed by house cats and windows every year.[9] Even the Sierra Club no longer seems overly concerned, pointing out that progress is being made to protect many bird habitats and that turbine-related death "pales in comparison to the number of birds and other creatures that would be killed by catastrophic global warming."[10] The Sierra Club's new positive spin on wind turbines is indicative of a shift in focus within the mainstream environmental movement—toward a notion that technologies such as wind turbines will mitigate climate change and related environmental threats posed by coal-fired power plants. Ahead, we'll consider why this is a frightfully careless assumption to make.

Detractors also cite wind turbines' less-well-known propensity to chop and distort radio, television, radar, and aviation signals in the same way a fan blade can chop up a voice. The United Kingdom has blocked several proposals for offshore wind farms, citing concerns about electromagnetic interference.[11] The 130-turbine Nantucket Sound project (known as the Cape Wind Project) stumbled in 2009 when the Federal Aviation Administration (FAA) claimed the offshore wind farm would interrupt navigation signals. FAA regulators insisted the developer pay $1.5 million to upgrade the radar system at Massachusetts Military Reservation or, if the upgrade could not solve the interference problem, pay $12 million to $15 million to construct an entirely new radar facility elsewhere.[12] A large expense to be sure, but not an insurmountable cost for a large wind-farm developer. Other wind-farm risks are not so easily reconciled.

Illustration 3: Road infiltrates a rainforest Roads offer easy access to loggers and poachers. Here a roadway backbone supports emerging ribs of access roads, which are dissolving this rainforest from the inside. (Image courtesy of Jacques Descloitres, MODIS Land Rapid Response Team, NASA/GSFC)

For instance, if you view satellite images of the Brazilian state of Pará, you'll see strange brownish formations of barren land that look like gargantuan fish skeletons stretching into the lush rainforest. These are roads. A full 80 percent of deforestation occurs within thirty miles of a road. Many of the planet's strongest winds rip across forested ridges. In order to transport fifty-ton generator modules and 160-foot blades to these sites, wind developers cut new roads. They also clear strips of land, often stretching over great distances, for power lines and transformers.[13] These provide easy access to poachers as well as loggers, legal and illegal alike. Since deforestation degrades biodiversity, threatens local livelihoods, jeopardizes environmental services, and represents about 20 percent of greenhouse gas emissions, this is no small concern.

Considering Carbon

The presumed carbon benefits of a remote wind farm, if thoughtlessly situated, could be entirely wiped out by the destructive impact of the deforestation surrounding it—a humbling reminder that *the technologies we create are only as durable as the contexts we create for them.*

Wind proponents are keen to proclaim that their turbines don't spew carbon dioxide. This is correct, but it is the answer to the wrong question. We'll consider some more revealing questions soon, but let's begin with a basic one: turbines may not exhaust CO_2 but what about the total carbon footprint of the mining, building, transporting, installing, clearing, maintaining, and decommissioning activities supporting them? Fossil fuels (including, especially, toxic bunker fuels) supply the power behind these operations. The largest and most efficient turbines rest upon massive carbon-intensive concrete bases, which support the hulking towers and (usually) prevent them from toppling in heavy winds. Any thoughtful consideration of the carbon implications of wind turbines should acknowledge these activities.

Nevertheless, carbon footprint calculations can be rather shifty, even silly at times, despite their distinguished columns of numerical support. They hinge on human assumptions and simplifications. They ignore the numerous other harms of energy production, use, and distribution. They say nothing of political, economic, and social contexts. They offer only the most rudimentary place to *start.*

Former UK leader of Parliament David Cameron installed a wind turbine on his London home, winning him positive reviews from econnoisseurs. However symbolically valuable, it was likely a waste of time, money, and energy according to carbon hawks. That's because homes, trees, towers, and other structures in cities choke airflow, which too often leaves the turbines unmotivated to spin. A British study claims that a third of small wind turbine locations in the windy coastal city of Portsmouth will never work off the carbon footprint invested to build and install them. A full two-thirds of Manchester's wind turbines leave their homes with a higher carbon footprint, not a lower one.[14]

Forceful gusts can whip wind shears up and around buildings, resulting in cracked blades or even catastrophic system failure.[15] The unexpected disintegration of a turbine with blades approaching the size and rotational velocity of a helicopter rotor could understandably produce significant damage anywhere, but in a city these harms become especially alarming. A single failure can take down power lines, tear through buildings, and pose obvious risks to residents. In practice, there are so many challenges to installing wind turbines on buildings, such as noise, insurance, and structural issues, that Mike Bergey, founder of a prominent turbine manufacturer, stated he wished people would stop asking him "about mounting turbines on buildings."[16]

Lifecycle calculations reveal that wind power technologies actually rely heavily on fossil fuels (which is partly why their costs have dramatically increased over the last decade). In practice, this leaves so-called renewable wind power as a mere fossil-fuel hybrid. This spurs some questions. First, if fossil-fuel and raw-material prices pull up turbine costs, to what degree can nations rely on wind power as a hedge against resource scarcity? Moreover, where will the power come from to build the next generation of wind turbines as earlier ones retire from service? Alternative-energy productivists would likely point to the obvious—just use the power from the former generation. But if we will presumably be using all of that output for our appliances, lighting, and driving the kids to school, will there be enough excess capacity left over? Probably not—especially given that the most favorable windy spots, which have been largely exploited, are purportedly satisfying less than 1 percent of global power demands. We'll likely have to fall back on fossil fuels.

Wind is renewable. Turbines are not.

Nevertheless, if we were to assume that NIMBY objections could be overcome (many could be), that turbines were built large enough to exceed their carbon footprint of production (as they usually are), and that other safety risks and disturbances could be lessened (certainly plausible), is there really anything to prevent wind energy from supplanting the stranglehold that dirty coal plants have on the world's electricity markets? Wind is a freely available resource around the globe, it doesn't have to be mined, and we don't have to pay to have it imported. There is, however, one little issue—one that is causing headaches on a monumental scale—which will lead us closer to understanding the biggest limitation of wind power.

Occasionally, wind has been known to stop.

A Frustratingly Unpredictable Fuel

Imagine if your home's electrical system were infested by gremlins that would without warning randomly vary your electrical supply—normal power, then half power, then three-quarter power, then off, then on again. Some days you'd be without electricity altogether and on others you'd be overloaded with so much current your appliances would short circuit and perhaps even catch on fire. This is the kind of erratic electrical supply that wind power grid operators deal with on a minute-to-minute basis. Whenever the wind slows, they must fire up expensive and dirty peaker power plants in order to fill the supply gap. Even when the wind is blowing, they often leave the plants on idle, wasting away their fossil fuels so they're ready when the next lull strikes. To make matters worse, grid operators must perform these feats atop a grid of creaky circuitry that was designed decades ago for a far more stable supply.

Traditional coal, natural gas, nuclear, and hydroelectric power stations provide a steady stream of power that operators throttle to match demand. Conversely, wind and solar electrical output varies dramatically. Windy periods are especially difficult to predict. Even when the wind is blowing more consistently, wind turbines encounter minor gusts and lulls that can greatly affect their minute-to-minute output. Over still periods, wind turbines can actually suck energy off the grid since stalled

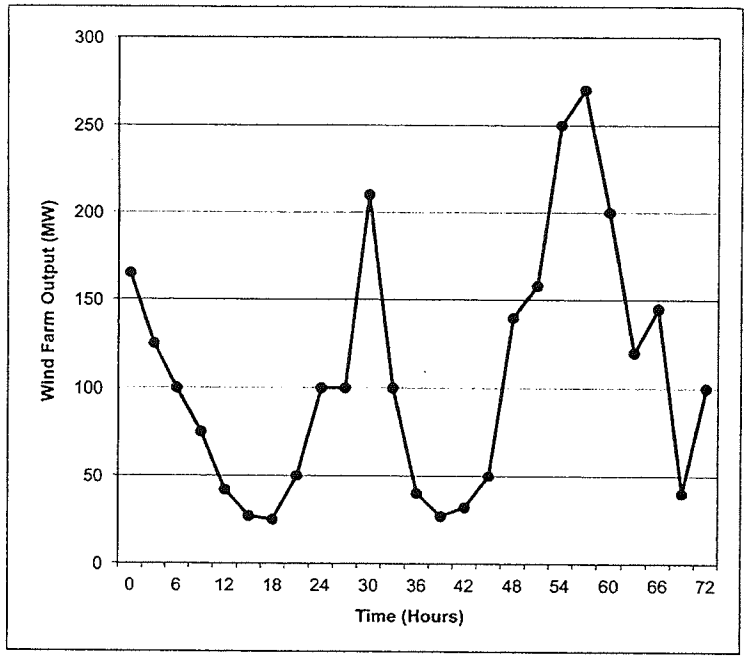

Figure 3: Fussy wind Wind farm output varies unpredictably. This chart shows the output of a large South Australian wind farm (in megawatts) over seventy-two hours. (Data from Tom Quirk)

turbines require electrical power to operate their massive steering systems and other idling functions.[17]

Solar radiation is more predictable in frequency but not in intensity, as shown in Figure 4. Even on mostly sunny days, solar photovoltaic output can vary due to dust, haze, heat, and passing clouds.[18]

Grid operators can handle small solar and wind inputs without much sweat (they manifest as small drops in demand). However, significant unpredictable inputs can endanger the very stability of the grid. Therefore, wind power isn't well suited to supply base-load power (i.e., the power supplying minimum demands throughout the day and night). If operators relied on

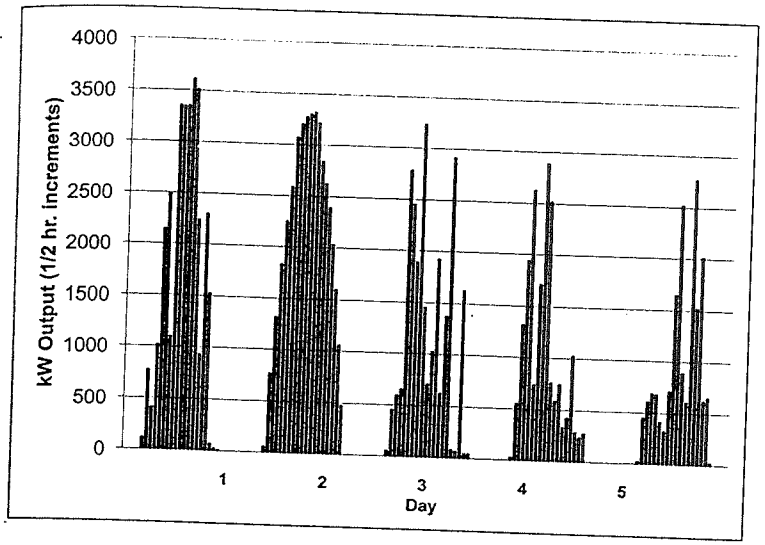

Figure 4: Five days of sun This plot shows the output (in kilowatts) of a large photovoltaic system in Springerville, Arizona, over five days. Heat, haze, clouds, and other factors affect minute-to-minute solar output unpredictably. (Data from Tucson Electric Power Company)

wind power as a base-load supply, traffic signals, hospitals, and other essential services would be cut whenever the wind stopped. Even though wind power companies employ teams of meteorologists to predict wind speeds on an hour-to-hour basis, they still rely on coal, natural gas, hydroelectric, and nuclear power for backup consistency.

This intermittency is already causing headaches in the country with the highest number of wind turbines per capita, Denmark. Over five thousand turbines produce the equivalent of about 20 percent of the nation's electricity demand but not even half of it can be used or stored within the country.[19] Since the Danes don't suddenly start using more electricity whenever it's windy, the grid verges on excessive supply, and grid operators are forced to dump excess electricity into neighboring Norway, Sweden, and Germany. America's grids appear even more

daunting as many cannot handle more than 2 percent intermittent wind power. Even with a national reinvention of the power network, such as the smart grid projects coming online in Hawaii and California, the most optimistic engineers don't expect them to handle any more than 30 percent live wind power, even if more turbines could be erected.

In one way, the Danes are fortunate. They can direct some excess wind power to Norway, where large pumps thrust water high into mountain reservoirs to be tapped by hydroelectric power plants when the wind slows.[20] This is an effective, yet expensive, strategy for buffering the erratic output of wind turbines. In many of the world's flat windy plains, this simply isn't an immediately available option, but turbines can be wired to mountainous locations for about $3 million per mile. Nevertheless, accommodating pumped storage on a large scale would require many more hydropower facilities, which bring their own set of disadvantages, as we will discuss later. Alternately, wind turbines can pressurize air into hermetically sealed underground caverns to be tapped later for power, but the conversion is inefficient and suitable geological sites are rare and often far away from electricity users. Finally, wind energy can be stored in batteries, flywheels, or as hydrogen gas, but these strategies are mind-numbingly pricey, as we shall explore later. Despite all the hype surrounding energy storage, experts debate whether these options could ever become effective large-scale solutions within the next thirty to fifty years, let alone in the more immediate future.

Policymakers, journalists, and wind proponents alike regularly misunderstand or misrepresent these windy realities. Proponents frequently declare that wind power costs the same as natural gas or just a bit more than coal, but this is misleading. Alternative-energy firms aren't required to back up their temperamental products, which makes them seem less pricey than they are in practice. It's during the power conditioning steps that the total costs of wind power start to multiply. The inconsistency of wind power necessitates a dual system, the construction and maintenance of one power supply network for when the wind is blowing and a second network for when it isn't—an incredibly expensive luxury.

Where the Wind Blows

We don't always get wind power *when* we want it, and we less often get it *where* we want it. In the United States, the strongest winds are all offshore. The strongest terrestrial gusts blow within a band stretching from the northern edge of Texas up through the Dakotas—right where almost nobody lives. Getting the wind crop to cities will be both technically knotty and expensive. As the director of North Dakota's Energy and Environmental Resource Center quips, "We produce the crop but we can't get it to the grain elevator."[21] Grid developers will also bump into right-of-way challenges since most residents disapprove of power lines as much as they do of wind turbines. The Sierra Club is actively challenging grid expansion through national forests, noting that the coal industry is ready to pounce on green grids.

Americans cannot count on a comprehensive smart grid any time soon, but the projected cost falls within the bounds of reason and an upgraded grid would bring numerous benefits. Most notably, a comprehensive smart grid would flip the long-held operating rule of power supply. Instead of utilities adjusting their output to meet demand, a smart grid would allow homes and businesses to adjust their electrical use automatically, based on the availability of power. That's because a smart grid coordinates electrical sensors and meters with basic information technology and a communications network akin to the Internet that can transform dumb power lines into a nimble and responsive transmission system. When a wind gust blows, tens of thousands of refrigerators will power up to absorb the added capacity

and when the wind lulls, they will immediately shut down again. Of course, not every household and industrial appliance lends itself to be so flexibly controlled—a respirator at a hospital, for example—but a smarter grid will nevertheless minimize the need for expensive peaker power plants and spinning reserve (i.e., idling power plants). Given incentives, consumers could trim peak electricity consumption by 15 percent or more, saving hundreds of billions of dollars in the process.[22]

Smart grids are less vulnerable to power leaks and electricity pilfering—two big holes in the existing national grid. Furthermore, smart grids are less likely to experience power outages, which cost Americans about $150 billion every year and require dirty diesel backup generators to fill gaps in service.[23] By simply plugging leaks and avoiding needless inefficiencies, a nationwide smart grid would save a stream of power equivalent to the raw output of thirty-five thousand large wind turbines. The energy conservation savings that smart grids enable would be greater yet—probably many times greater. And unlike the wildly optimistic conjectures propping up alternative energy policies, smart grid estimations are quite sound; numerous other countries have already rolled out similar upgrades with great success. Sweden, for instance, installed smart meters across the nation quite some time ago.

There is much work to be done if the United States is ever to make similar strides. Regulators will have to coordinate standards and negotiate how the costs and benefits will be shared between the nation's three hundred utilities, five hundred transmission owners, and hundreds of millions of customers. Additionally, a connected smart grid will require a different form of security than comparatively dumb grids of today. Unfortunately, these responsible tasks are all too easy to cast aside when the magical lure of solar cells and wind turbines woos so insistently upon the imaginations of politicians, environmentalists, and the media.

Capacity Versus Production

Do you know the maximum speed of your car? It is safe to venture that most divers don't, save for perhaps German autobahners, since they rarely if ever reach maximum speed. The same holds for power plants—they *can* go faster than they *do*. A plant's maximum output is termed "nameplate capacity," while the actual output over time is called "production." The difference is simple, yet these two measures are confused, conflated, and interchanged by journalists, politicians, and even experts.

A "capacity factor" indicates what percentage of the nameplate maximum capacity a power plant actually produces over time. In traditional plants, operators control production with a throttle. A small one-hundred-megawatt coal plant will only produce 74 percent of that amount on average, or seventy-four megawatts.[24] For wind and solar, as we have already seen, the throttle is monitored by Mother Nature's little gremlins. A large wind farm with a nameplate capacity of one hundred megawatts will produce just twenty-four megawatts on average since the wind blows at varying strengths and sometimes not at all.[25] Every generation mechanism is therefore like a bag of potato chips—only partially full—as shown in Figure 5.

In order to match the production of a large 1,000-megawatt coal-fired power plant with a wind farm, 1,000 megawatts of wind turbines won't be enough. For an even swap, we'd need more than three times the wind capacity, about 3,100 megawatts. Both a 1,000-megawatt coal plant producing on average at 74 percent of capacity and a 3,100-megawatt wind farm producing on average at 24 percent of capacity will yield about the same output over time. Of course, this hypothetical comparison is still inadequate for real-world comparisons given the inconsistency of wind power. Therefore, energy analysts use a reliability factor to measure the minimum percentage of wind power that turbines can deliver 90 percent of the time. Taking this into

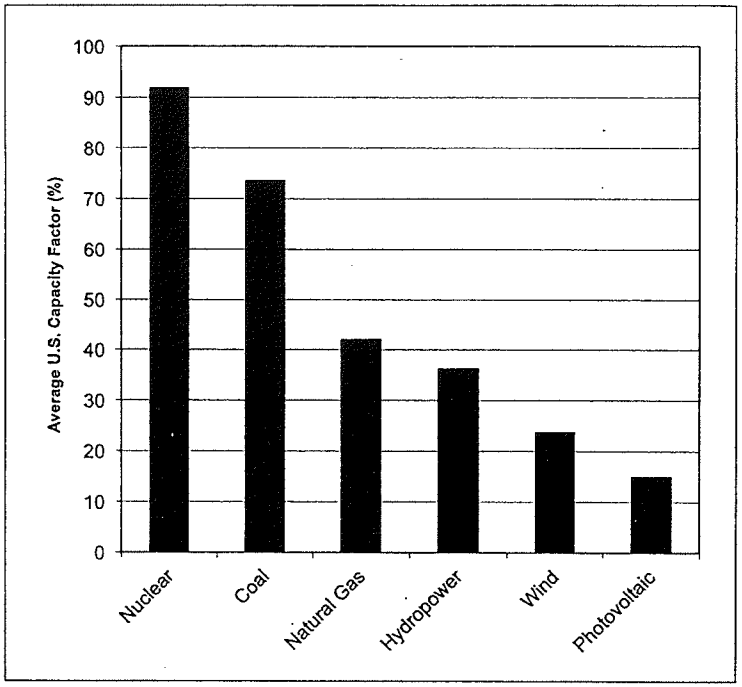

Figure 5: U.S. capacity factors by source A capacity factor is the percentage of the nameplate maximum capacity that a power plant actually produces over time. Fossil fuel, hydro, and nuclear plants attain nearly 100 percent of maximum capacity when fully throttled, but lulls in demand and cost differentials leave them producing less. Natural gas is more expensive than coal, so power companies turn off gas plants first when demand drops. Weather variables dictate wind and photovoltaic capacity factors. (Data from U.S. Department of Energy)

account, we would need up to 18,000 megawatts of wind power to offset a 1,000-megawatt fossil-fuel or nuclear plant 90 percent of the time.[26] As Leigh Glover, a policy fellow at the Center for Energy and Environmental Policy at the University of Delaware, sums up, "When basic calculations are completed for the number of wind turbines or PV arrays needed to replace the world's coal-fired power stations, the resulting scenarios verge on nothing less than bizarre."[27]

In fact, the rise of wind power in the United States has sadly not shuttered a single coal-powered plant.[28] So why might we think building more turbines will magically serve us any better? Well, it's likely because the story lines surrounding wind power are so compelling. And it just so happens that part of that magic was manufactured.

Manufacturing the Magic

When President Obama premiered his clean energy initiative in Newton, Iowa, he cited a prominent U.S. Department of Energy (DOE) report showing that the nation could easily obtain 20 percent of its electricity from wind turbines by 2030—he may have been completely unaware that the report's key dataset wasn't from the DOE at all. In fact, if genuine DOE cost and performance figures had been used, the report's authors would likely have come to the opposite conclusion—20 percent wind by 2030 will be logistically complex, enormously expensive, and perhaps ultimately unachievable.

Much of the enthusiasm surrounding wind power in recent years has grown out of this prominent Bush-era report entitled *20% Wind Energy by 2030*, which concludes that filling 20 percent of the nation's grid with wind power is achievable and will come at a cost described as "modest." The authoritative DOE report has been held up as a model for charting a course for wind energy funding; it has been covered by media sources across the globe, presented to congressional leaders, evoked by two presidents, and supported by the Sierra Club, the Worldwatch Institute, the Natural Resources Defense Council, and dozens of other organizations.[29] In fact, during my investigative research on the study, I didn't come across a single critical review of its findings. It is therefore particularly intriguing to note that the report is based on key assumptions, hidden within a second appendix, which are so explicitly incongruent with bona fide DOE data that many people might have considered them to be

outright fraudulent had they not been produced within the protective halo surrounding alternative-energy research. This DOE report, which probably seemed ecologically progressive to its unwitting list of environmentalist cosponsors, may ultimately prove a tremendous disservice to their cause.

The report's most remarkable conclusion is simple. Filling 20 percent of the grid with wind power over the next twenty years will cost just 2 percent more than a scenario without wind power.[30] The conclusion teeters atop a conspicuous pile of cost and performance figures developed by industry consultants, despite the fact that the DOE already spends millions of dollars tabulating the same sorts of data on a routine basis. The report cites four "major" contributors outside the Department of Energy: a trade organization called American Wind Energy Association (AWEA) and three consulting firms—Black and Veatch, Energetics Incorporated, and Renewable Energy Consulting Services. Would perhaps any one of these groups have something to gain from painting an optimistic rendering of wind's future? It turns out they all do. And that potential gain can be measured in billions.

When the report was written, the AWEA's board of directors included executives from General Electric, JP Morgan, Shell, John Deere, and a handful of wind power companies including T. Boone Pickens's company Mesa Power. As an industry group, the AWEA was interested in orchestrating a positive spin on anything wind. The AWEA salivated in anticipation of preparing a pro-wind report enshrouded by the credibility of the Department of Energy.

But, there was a problem.

The DOE's field data on wind turbine performance was too grim—too realistic—for a report destined to pump up the future of wind power. Far more favorable statistics would be required. And the consultant employed to produce the stand-in datasets would not disappoint.

The authors retained Black and Veatch—a consultancy that designs both wind farms and natural-gas generation plants—to develop cost projections as well as key capacity factors for the analysis.[31] Remember, a capacity factor is simply the percentage of a wind turbine's nameplate capacity that is actually produced under real-world conditions—the difference of a percent or two can make or break a wind farm. According to DOE data, when countries or regions start to install wind turbines, the average capacity factor goes up at first, then levels off or declines as additional turbines are sited in less-ideal locations.[32] For instance, between 1985 and 2001, the average capacity factor in California rose impressively from 13 percent to 24 percent, but has since retreated to around 22 percent. Over recent years, Europe's maturing wind farms have stabilized below 21 percent.[33] The U.S. average is under 26 percent, according to field readings from the DOE. That's why Black and Veatch's capacity-factor assumptions, starting at 35 percent to 52 percent in 2010, and continuing to increase 15 percent by 2030, are particularly shocking.

Black and Veatch's average capacity-factor estimations rank among the highest ever published anywhere, let alone in a formal government report. If Black and Veatch knows how to run the nation's turbines at such high capacity, then they know something that nobody else does. Even the pro-wind AWEA caps realistic capacity factors at a terribly optimistic 40 percent—so, incidentally, does the Department of Energy.[34] In fact, Black and Veatch's expectation that capacity factors for wind turbines will *increase* over the next twenty years conflicts with other DOE reports, which forecast turbulence as future wind farms are forced into subprime locations.

The knowledgeable public servants at the DOE might have laughed Black and Veatch out of Washington. But they didn't. They got them published.

The justifications for employing such extraordinary assumptions are not entirely clear. During my investigation, a DOE official assured me that the Black and Veatch figures "were extensively critiqued and adjusted by experts in the wind and general energy communities." Though when I asked a director at Black and Veatch why their figures differed so dramatically from DOE assumptions, he was rather tight-lipped, insisting only that they stood by the methodology as outlined in the report.[35] That's particularly disconcerting.

The report's methodology section states simply, "Black and Veatch used historical capacity factor data to create a logarithmic best-fit line, which is then applied to each wind power class to project future performance improvements." It seems the consultancy assumed that the wind turbine learning curve (i.e., the idea that past experience with a technology helps to improve the technology and reduce its costs) would continue to produce gains well into the future. While it is well accepted that this occurred through the 1980s and 1990s, the learning curve has since flattened, as the DOE has documented. Therefore, extrapolating a select few years of data into the future without acknowledging the industry's maturation is as problematic as extrapolating the growth of high school students to show that by college they will stand taller than giraffes.

In addition to the optimistic capacity-factor projections, the report's analysis includes mysterious historical data. Black and Veatch "estimated" capacity factors ranging from 32 percent to 47 percent in 2005.[36] The report fails to mention that DOE fieldwork from that year placed the actual nationwide capacity factor closer to 20 percent.[37] (When I asked Black and Veatch about the discrepancy, they offered no further comment.) These discrepancies aren't the only surprises lurking in the report's appendices.

Black and Veatch assumed that the costs for building, installing, and maintaining future wind turbines will not increase, as other DOE reports predict, but will actually decrease, due to what

it black-boxes as "technology development." But since today's turbine designs are already close to their theoretical maximum efficiency, the future success of wind power may be less influenced by technological development than by social and environmental variables. Many of the windiest sites present high barriers to entry. Since turbines must be spaced at least five rotor-diameters apart side-to-side and at least ten rotor diameters front-to-back in order to avoid a wind "shading" effect, vast stretches of land rights must be secured in order to create even a modestly scaled wind farm. Offshore sites are easier to procure and have strong, consistent winds, but they are expensive to develop, connect, and maintain for obvious reasons—inaccessibility, deep sea beds, high waves, corrosive salt water, hurricanes, and so on. The Department of Energy expects that suboptimal environments—with greater wind turbulence, wind variability, and unfavorable site factors such as steep slopes, terrain roughness, and reduced accessibility—will push up the cost of most of the remaining wind farm sites by some 200 percent.[38]

When Black and Veatch's capacity-factor assumptions are compounded by their cost assumptions, readers are left with an impression of wind power that is up to *six times* more impressive than if the analysis were run using the DOE's own figures.[39] This raises the question, Why did the Department of Energy base its pivotal wind energy report on numbers conjured up by an engineering firm, with a vested interest in advancing energy production interests, rather than its own data? This is the question I posed to the DOE.

Their response was telling. They made it apparent that even though the report claims to contain "influential scientific information," its analyses might not be recognized as such by the greater scientific community.[40] One of the report's lead editors told me, "The *20% Wind* work was carried out to develop a picture of a future in which 20 percent of the nation's electricity is provided from the wind, and to assess the feasibility of that

picture. The work was based on the assumption that reasonable orderly advancement of the technology would continue, and that key issues needing resolution would be addressed and favorably resolved. Hence the work used input information and assumptions that were forward-looking rather than constrained by recent history."[41]

Indeed, the authors did not allow recent history to stand in their way. In fact, some might argue that their answer echoes the rhetoric used to defend the fabrication of data for which no historical justification or cultural context exists. Energy players employed such lines of reasoning to suggest that by the 1960s, nuclear energy would produce abundant clean energy for all, that by the 1970s, fusion power would be too cheap to meter, and that solar cells would be fueling the world's economies by 1986.[42] With the advantage of hindsight, historians of science romp in the particulars of how such declarations rose to prominence. They show how genuine inquiry was often pushed aside to make room for the interests of industrial elites in their attempts to pry open taxpayer coffers for subsidies. Will future historians judge the *20% Wind Energy by 2030* report similarly?

Yes, reasons Nicolas Boccard, author of two academic papers recently published in *Energy Policy*.[43] In his opinion, the kind of tomfoolery going on at the DOE is nothing particularly shocking. Boccard, who studies the phenomenon of capacity-factor exaggerations in Europe, found that when solid data do not exist, wind proponents are all too willing to make "unsubstantiated guesses." They get away with it because the public, politicians, journalists, and even many energy experts don't understand how capacity factors are involved in influencing prospects for wind power development. Or, perhaps caught up in the excitement surrounding wind energy, proponents may simply not care, due to a psychological phenomenon called selection bias, whereby people tend to overvalue information that reinforces their ideology and undervalue that which contradicts it. Boccard insists, "We cannot fail to observe that academic outlets geared at renewable energy sources naturally attract the authors themselves supportive of renewable energy sources, as their writing style clearly indicates. As a consequence, this community has (unconsciously) turned a blind eye to the capacity factor issue." He compared wind farm data across many European countries, where wind power penetration is many times higher than in the United States. He uncovered a worrisome gap between the anticipated and realized output of wind turbines. In fact, Boccard maintains, the difference was so large that wind power ended up being on average 67 percent more expensive and 40 percent less effective than researchers had predicted. As a rule of thumb, he maintains that any country-level assumptions of capacity factors exceeding 30 percent should be regarded as "mere leaps of faith."[44]

It might seem counterproductive for wind firms to risk overinflating expectations, but only if we assume that real-life turbine performance will impact their profit potential. It won't. Consulting firms such as Black and Veatch stand to lock in profits during the study and design phase, long before the turbines are even brought online. The AWEA manufacturers stand to gain from the sale of wind turbines, regardless of the side effects they produce or the limitations they encounter during operation. And by placing bets on both sides of the line, with both wind turbines and natural gas, Pickens was positioned to gain regardless of the wind's motivations. If the turbines don't return on the promise, it's no big deal for those in the money. The real trick is convincing the government, and ultimately taxpayers, into flipping for as much of the bill as possible. And one of the best tools for achieving that objective? A report that can be summarized in a sound bite struts with an air of authority, and can glide off the president's tongue with ease. *20% Wind Energy by 2030.*

It may be tempting to characterize this whole charade as some sort of cover-up. But the Department of Energy officials I interviewed were certainly open (if nervous) to my questions; anyone with an Internet connection can access the report and its suspect methodologies; and the DOE regularly publishes its field measurements in a report called the *Annual Energy Outlook*. There's no secret. Energy corporations develop "forward-looking" datasets favorable to their cause, government employees slide those datasets into formal reports, the Department of Energy stamps its seal on the reports, and the Government Printing Office publishes them. Then legislators hold up the reports to argue for legislation, the legislation guides the money, and the money gets translated into actions—usually actions with productivist leanings. It isn't a cover-up. It's standard operating procedure. This may be good or bad, depending on your political persuasion. This well-oiled system has operated for years, with all actors performing their assigned duties. As a result, Americans enjoy access to ample and inexpensive energy services and we have a high standard of living to show for it. But this process nevertheless leads to a certain type of policy development—one that is intrinsically predisposed to favor energy *production* over energy *reduction*. As we shall see, this sort of policy bent—while magnificently efficient at creating wealth for those involved—does not so clearly lead to long-term well-being for everyone else.

Step *Away* from the Pom-Poms

When Big Oil leverages questionable science to their benefit, environmentalists fight back en masse. As they should. But when it comes to the mesmerizing power of wind, they acquiesce. No op-eds. No investigative reports. No magazine covers.

Nothing.

If environmentalists suspected anything funny about the *20% Wind Energy by 2030* report, they didn't say anything about it in public. Instead, fifty environmental groups and research institutes, including the Natural Resources Defense Council, Sierra Club, and Lawrence Berkeley National Laboratory opted to double-down their windy bets by formally backing the study. When the nation's smartest and most dedicated research scientists, physicists, and environmentalists roll over to look up googly-eyed at *any* corporate energy production report, it's worthy of our attention. This love affair, however, is harmful to the environmentalists' cause for a number of reasons.

First, fetishizing overly optimistic expectations for wind power takes attention away from another grave concern of environmental groups—reducing dirty coal use. Even if the United States could attain 20 percent wind energy by 2030, the achievement alone might not remove a single fossil-fuel plant from the grid. There is a common misconception that building additional alternative-energy capacity will displace fossil-fuel use; however, over past years, this hasn't been the case. Producing more energy simply increases supply, lowers cost, and stimulates additional energy consumption. Incidentally, some analysts argue that the mass deployment of wind turbines in Europe has not decreased the region's carbon footprint by even a single gram. They point to Spain, which prided itself on being a solar and wind power leader over the last two decades only to see its greenhouse gas emissions rise 40 percent over the same period.

Second, the pomp and circumstance around wind diverts attention from competing solutions that possess promising social and ecological value. In a cash-strapped economy, we have to consider the trade-offs. As journalist Anselm Waldermann points out, "when it comes to climate change, investments in wind and solar energy are not very efficient. Preventing one ton of CO_2 emissions requires a relatively large amount of money. Other measures, especially building renovations, cost much less—and have the same effect."[45]

The third problem is the problem with all myths. When they

don't come true, people grow cynical. Inflated projections today endanger the very legitimacy of the environmental movement tomorrow.

Every energy-production technology carries its own yoke of drawbacks and limitations. However, the allure of a magical silver bullet can bring harms one step closer. Illusory diversions act to prop up and stabilize a system of extreme energy consumption and waste. Hype surrounding wind energy might even shield the fossil-fuel establishment—if clean and abundant energy is just over the horizon, then there is less motivation to clean up existing energy production or use energy more wisely. It doesn't help when the government maintains two ledgers of incompatible expectations. One set, based on fieldwork and historical trends, is used internally by people in the know. The second set, crafted from industry speculation and "unconstrained" by history, is disseminated via press releases, websites, and even by the president himself to an unwitting public.

It may be time for mainstream environmental organizations to take note of this incongruence, put away the clean energy pom-poms, and get back to work speaking up for global ecosystems, which are hurt, not helped, by additional energy production. Because as we shall see, the United States doesn't have an energy crisis. It has a consumption crisis. Flashy diversions created through the disingenuous grandstanding of alternative-energy mechanisms act to obscure this simple reality.

3. Biofuels and the Politics of Big Corn

Years ago, fairy tales all began with "Once upon a time . . ." Now we know they all begin with, "If I am elected." —Carolyn Warner

Iowa. That's the answer to a question that growing numbers of scientists, aid workers, reporters, and environmentalists are asking about ethanol and other biofuels. But before we can address the *question*, it would be helpful to understand what biofuels are and how they are affecting our energy infrastructure.

Biofuels in Sixty Seconds or Less

Like photovoltaics and wind turbines, biofuels are another way to harness power from the sun, but through photosynthesis. Unlike wind turbines and solar photovoltaics, biofuels are easily stored and dispatched as needed, much like oil, coal, and natural gas, making their energy far more valuable.

Before the industrial revolution, biomass materials (i.e., living and recently dead plant material, such as firewood, and biological material, such as dung) were humanity's primary sources of energy.[1] The world's first mass-produced flex-fuel